Center Innovation Fund: GSFC CIF

Solar ENA Imaging Coronagraph

Completed Technology Project (2011 - 2012)

Project Introduction

Observations of energetic neutral atoms (ENAs) provide the only way to observe solar energetic particles (SEPs) where they are accelerated. The one observation of solar ENAs to date had low sensitivity, a high energy threshold, and no imaging information. The Solar Energetic Neutral-atom Imaging Coronagraph (SENIC) instrument concept combines large detector area, a low energy threshold, and high angular resolution. The key design challenge for this concept was to minimize the level of stray light illuminating the detectors.

Measurements of energetic neutral atoms (ENAs) are a new tool to improve our understanding of energy release and particle acceleration in solar eruptive events. Due to limitations of past observations, even the most basic questions remain unanswered about the acceleration of solar energetic particles (SEPs) by shocks driven by coronal mass ejections (CMEs). ENAs provide the only way to observe SEPs where they are accelerated. The one observation of solar ENAs to date had low sensitivity, a high energy threshold, and no imaging information. The Solar Energetic Neutral-atom Imaging Coronagraph (SENIC) instrument concept is designed to observe ENAs from <~20 keV to a few hundred keV with a spectral resolution as good as 1 keV and image them from 2 R_sun to 40 R_sun with a spatial resolution of 0.1 R_sun. Since ENAs cannot be imaged with focusing optics, this concept uses an indirect imaging technique similar to the one successfully used on RHESSI. Thus, the SENIC instrument concept combines large detector area, a low energy threshold, and high angular resolution.

Anticipated Benefits

N/A

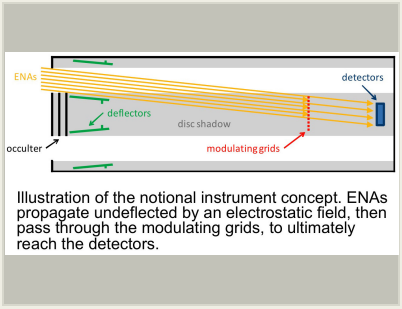

Illustration of the notional instrument concept. ENAs propagate undeflected by an electrostatic field, then pass through the modulating grids, to ultimately reach the detectors.

Project Image ROE FY12 CIF 349 HP Solar ENA Imaging Coronagraph

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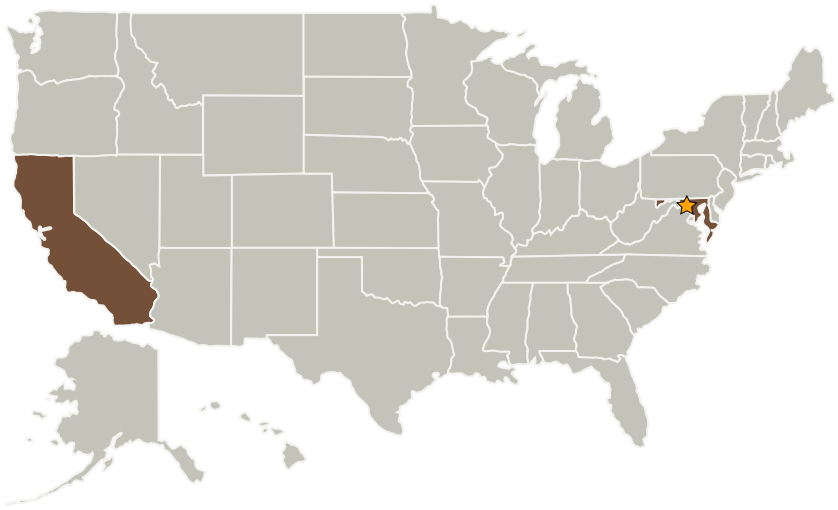
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
University of California-Berkeley(Berkeley)	Supporting Organization	Academia	Berkeley, California

Primary U.S. Work Locations	
California	Maryland

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Innovation Fund: GSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Peter M Hughes

Project Manager:

Timothy C Gehringer

Principal Investigator:

Albert Y Shih

Co-Investigators:

Joseph M Davila
Qian Gong
David L Linard

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Images

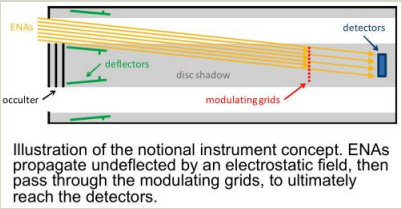


Illustration of the notional instrument concept. ENAs propagate undeflected by an electrostatic field, then pass through the modulating grids, to ultimately reach the detectors.

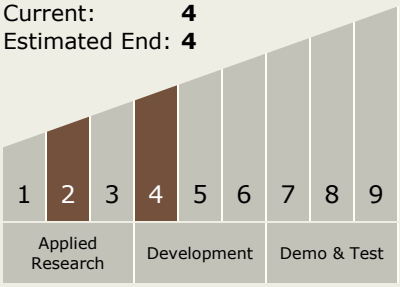
79.jpg
Project Image ROE FY12 CIF 349
HP Solar ENA Imaging Coronagraph
(https://techport.nasa.gov/image/1170)

Project Website:

http://sciences.gsfc.nasa.gov/sed/

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.4 Space Weather Prediction